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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/808,941	03/25/2004	Eghart Fischer	P04,0090	6877

26574 7590 07/17/2008

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EXAMINER	
SUTHERS, DOUGLAS JOHN	
ART UNIT	**PAPER NUMBER**
2615	

MAIL DATE	DELIVERY MODE
07/17/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/808,941	FISCHER, EGHART	
	Examiner	Art Unit	
	DOUGLAS SUTHERS	2615	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on *10 March 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-27* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-27* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *10 March 2008* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *03/26/08*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

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DETAILED ACTION

The Art Unit location of your application in the USPTO has changed. To aid in correlating any papers for this application, all further correspondence regarding this application should be directed to Art Unit 2615.

Specification

Claim 1 is objected to because of the following informalities: the claim refers to "an **exteme** value", which should most likely read "an **extreme** value". Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-2, 5-8, 11-12, 15-23 are rejected under 35 U.S.C. 102(b) as being anticipated by Nakazawa (US 6069961).

Regarding claim 1, Nakazawa discloses a method for determining the direction of incidence of an incoming audio signal from an acoustic source to a directional microphone system, having at least two microphones, comprising the steps of:

detecting said incoming audio signal with said at least two microphones (figure 3A, items 1a-7b) and, in each of said at least two microphones, producing an output microphone signal therefrom (figure 4, signal from items 1a-7b);

generating at least two phase-shifted directional microphone signals (from items 11a) by phase shifting (subtractor 11a shifts negative signal 180 degrees) at least one output microphone signal relative to another output microphone signal and combining the respective phase shifted output microphone signals with respective weightings (subtractors 11a weight one signal as positive one, the other minus one), the respective weightings defining a direction-dependent sensitivity distribution, having a minimum in one direction, for the respective directional microphone signals (figure 1B);

assessing each of said directional microphone signals with respect to a quantity that indicates an influence, on the respective directional microphone signal, by the associated direction-dependent sensitivity distribution (11c); and

comparing the respective quantities of the respective directional microphone signals with each other (20 finds minimum) to identify a quantity having an extreme value (minimum from 11d), and determining the direction of incidence of said incoming audio signal as being the direction at which the minimum of the direction-dependent sensitivity distribution for the directional microphone signal having said extreme value is located (direction is in direction of minimum).

Regarding claim 2, Nakazawa discloses comprising employing energy (items 11b and 11c represent a measure of the energy in the signal) in the respective directional microphone signals as said quantity, and determining the direction of the minimum of the direction-dependent sensitivity distribution having the least energy as being said direction of incidence.

Regarding claim 5, Nakazawa discloses comprising setting the respective weightings to minimize the sensitivity of the directional microphone system for a signal source located in a selected direction with respect to the directional microphone system (weightings are set so minimum level is found in selected direction).

Regarding claim 6, Nakazawa discloses comprising selecting said weighting to embody an effect of an acoustic environment in which said directional microphone system is being used (weighting embodies all acoustic effects).

Regarding claim 7, Nakazawa discloses comprising determining the respective weightings by measuring the sensitivity of the directional microphone system at a head or a head simulation (figure 1 shows measured sensitivity from microphones which are inherently simulations of human hearing, or head simulations).

Regarding claim 8, Nakazawa discloses wherein each of said microphone signals has an amplitude and a phase, and comprising employing a weighting having an amplitude factor and a phase factor for correcting at least one of the amplitude or the phase of at least one of said microphone signals (weighting includes amplification factor of figure 1).

Regarding claim 11, Nakazawa discloses comprising generating said directional microphone signals substantially simultaneously (all done simultaneously).

Regarding claim 12, Nakazawa discloses comprising varying the respective weightings for two or more of said directional microphone signals to successively produce respective directional microphone signals having direction-dependent sensitivity distributions (weightings vary due to angle of bisector).

Regarding claim 15, Nakazawa discloses comprising weighting the respective microphone signals from the microphones in said directional microphone system in pairs to produce said directional microphone signal (1a-7a paired with 1b-7b).

Regarding claim 16, Nakazawa discloses wherein said incoming audio signal is a first incoming audio signal from a first source, and comprising detecting a second incoming audio signal from a second signal source with said microphones in said directional microphone system, and determining the direction of incidence of said

second incoming audio signal from said quantity (first and second signals evaluated consecutively).

Regarding claim 17, Nakazawa discloses comprising assessing said quantities for said first and second incoming audio signals in a same frequency band by correlation (frequency band lower than LPF is used, highly correlated signals give lower value from subtractor).

Regarding claim 18, Nakazawa discloses comprising assessing said first and second incoming audio signals by correlation according to an echo relationship (peak/hold treats echoes similarly).

Regarding claim 19, Nakazawa discloses comprising assessing said quantities for said first and second incoming audio signals in respectively different frequency bands by correlation (each frequency band lower than LPF is used, highly correlated signals give lower value from subtractor).

Regarding claim 20, Nakazawa discloses comprising assessing said first and second incoming audio signals by correlation according to an echo relationship (peak/hold treats echoes similarly).

Regarding claim 21, Nakazawa discloses comprising experimentally determining the direction of the minimum of each direction-dependent sensitivity distribution using an experimental signal source with said directional microphone system (figures 1, 2, and 3 contain experimental signal sources).

Regarding claim 22, Nakazawa discloses comprising determining the direction of the minimum of the direction-dependent sensitivity distribution by calculation with measured transfer functions (figure 2A).

Regarding claim 23, Nakazawa discloses an apparatus for determining a direction of incidence of an incoming audio signal comprising:

a directional microphone system having at least two microphones (figure 3A, items 1a-7b) for detecting said incoming audio signal, each of said at least two microphones generating a microphone signal therefrom (figure 4, signal from items 1a-7b);

a phase-shifter (subtractor 11a shifts negative signal 180 degrees) that phase-shifts at least one microphone signal of said system relative to another microphone signal of said system;

weighting units for respectively weighting said microphone signals (subtractors 11a weight one signal as positive one, the other minus one) for producing at least two directional microphone signals (from items 11a), the respective weightings defining a

direction-dependent sensitivity distribution for each of said directional microphone signals (figure 1B);

an assessment unit for assessing the respective directional microphone signals with respect to a quantity representing an influence of the direction-dependent sensitivity distribution on the directional microphone signal (11c); and

a determination unit that identifies one of said directional microphone signals having an extreme value (20 finds minimum) of said quantity compared to the other directional microphone signals, and for determining the direction of incidence of said incoming audio signal as being a direction in which a minimum of the direction-dependent sensitivity distribution of said one of said directional microphone signals is located (direction is in direction of minimum).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 3-4, and 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakazawa (US 6069961).

Regarding claim 3, Although Nakazawa does not expressly disclose employing a reciprocal of energy, using such is an equivalent variation. Nakazawa looks for a minimum energy which is associated with the maximum probability of being the correct direction. It would have been equivalent to look for a maximum of a reciprocal of the energy to be associated with the maximum probability. Therefore it would have been obvious to further comprise employing a reciprocal of energy of the respective directional microphone signals as said quantity, said reciprocal of said energy representing a probability that the direction of the minimum of the direction-dependent sensitivity distribution of the directional microphone signal associated with the reciprocal is said direction of incidence.

Regarding claim 4, Nakazawa discloses comprising combining the respective probabilities of the directional microphone signals to form a direction-resolved probability distribution, and determining the direction of incidence of said incoming audio signal from said probability distribution (chooses minimum signal which is maximum probability).

Regarding claim 9, although Nakazawa does not expressly disclose storing said weighting as a frequency-dependent characteristic, it would have been obvious to do such. The motivation to do so would have been to allow for unit 20 to store information on the microphone array, such as that of figure 2A, for direction or filter coefficient calculations. Therefore at the time of invention, it would have been obvious to one of

ordinary skill in the art to further comprise storing said weighting as a frequency-dependent characteristic.

Regarding claim 10, although Nakazawa does not expressly disclose comprising reading the respective weightings from a memory, it would have been obvious to do such. The motivation to do so would have been to allow for reconfigurable weights and reuse of components such as adders, thereby reducing costs and size. Therefore at the time of invention, it would have been obvious to one of ordinary skill in the art to further comprise reading the respective weightings from a memory.

Claims 13-14, and 24-27 rejected under 35 U.S.C. 103(a) as being unpatentable over Nakazawa (US 6069961) in view of Elko et al. (US 6584203 B2).

Regarding claim 13, Nakazawa does not disclose subband analysis.

Elko discloses wherein each of the microphone signals has a frequency range, and comprising subdividing each frequency range into a plurality of frequency bands (figure 8, items 820 and 822), each having a microphone signal component therein, and using said microphone signal components as said microphone signals (from 816).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use the subband analysis of Elko in the system of Nakazawa. The motivation for doing so would have been better model the transfer functions of the

microphones and better isolate desired sound sources. Therefore, it would have been obvious to combine Elko with Nakazawa to obtain the invention as specified in claim 13.

Regarding claim 14, Nakazawa discloses comprising assessing the respective quantities of the respective directional microphone signals in at least two of said frequency bands (each of the bands is used via 824).

Regarding claim 24, Nakazawa does not expressly disclose subband processing.

Elko discloses comprising, for each of the microphones, a filter bank (figure 8, items 820,822) connected thereto for subdividing the microphone signal from the microphone signal connected thereto into a plurality of frequency bands each frequency band having an output at which a signal component of the microphone signal in that frequency band is present, with respective outputs of the respective filter banks in the same frequency band being connected in pairs to weighting units (806-816), said weighting unit comprising at least one of an amplitude unit (814) for varying an amplitude of the signal component and a phase unit (806) for shifting the phase of the signal component.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use the subband analysis of Elko in the system of Nakazawa. The motivation for doing so would have been better model the transfer functions of the

microphones and better isolate desired sound sources. Therefore, it would have been obvious to combine Elko with Nakazawa to obtain the invention as specified in claim 24.

Regarding claim 25, Elko discloses wherein said weighting unit comprises both said amplitude units (814) and said phase units (806), and wherein said amplitude units and said phase unit operate jointly on each signal component.

Regarding claim 26, Elko discloses wherein an assessment unit comprises a plurality of assessment subunits (multiple LPF 818 as mentioned in summary and claim 10) respectively operating in different ones of said frequency bands for assessing said quantity in the different frequency bands, and an analysis unit connected to said assessment subunits for generating, from the assessment of the quantities in the respectively different frequency bands, an acoustic environment analysis result (Yout(t) for each band).

Regarding claim 27, Elko discloses wherein said analysis result generates said acoustic environment analysis result by a correlation analysis of a time response in the different frequency bands (difference signal represents correlation).

Response to Arguments

Applicant's arguments filed March 10th, 2008 have been fully considered but they are not persuasive.

Regarding applicants arguments regarding weightings, it is the examiner's position that the directional characteristics shown in figure 1 of the Nakazawa reference are "direction-dependent sensitively distributions", displaying the sensitivity to sound in a given direction. The weightings given by the subtractors 11a and the choice of microphone inputs define the pattern. Applicant in general argues points about the weightings that are claimed to belong to the direction-dependent sensitively distribution, not the weightings. As noted above the distributions are dependent on direction and have minimums as shown at angle zero in figure 1B.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas Suthers whose telephone number is (571)272-0563. The examiner can normally be reached on 8am - 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivian Chin can be reached on (571)272-7848. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Douglas Suthers/
Examiner, Art Unit 2615

/Vivian Chin/
Supervisory Patent Examiner, Art Unit 2615